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Thirty-Second Annual Report

OF THE

Agricultural Experiment Station

OF THE

Alabama Polytechnic Institute

Auburn, Alabama

January, 1920

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ALABAMA POLYTECHNIC INSTITUTE

Auburn, Ala., Jan. 23, 1920.

Governor Thomas E. Kilby,
Executive Department,
Montgomery, Ala.

Sir:

I have the honor herewith to transmit to you the Thirty-Second Annual Report of the Agricultural Experiment Station of the Alabama Polytechnic Institute.

This report is made in accordance with the Act of Congress approved March 2, 1887, establishing agricultural experiment stations, and the Act of Congress approved March 16, 1906, known as the Adams Act.

Respectfully,
B. B. ROSS,
Acting President.

Auburn, Ala., Jan. 22, 1920.

Dr. B. B. Ross, Acting President,
Alabama Polytechnic Institute,
Auburn, Ala.

Sir:

I herewith submit the Thirty-Second Annual Report of the Experiment Station of the Alabama Polytechnic Institute for the fiscal year ending June 30, 1919.

It contains the detailed report of the Director, the Agriculturist, the Agronomist, the Plant Breeder, the Treasurer, the Chemist, the Veterinarian, the Botanist, the Horticulturist, the Entomologist, the Plant Pathologist, and the Animal Husbandman, for the year ending December 31, 1919.

Respectfully submitted,

J. F. DUGGAR,
Director, Experiment Station.

BOARD OF TRUSTEES

His Excellency, Thomas E. Kilby, President.....Ex-Officio
Spright Dowell, Superintendent of Education.....Ex-Officio
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STATION STAFF

B. B. Ross, Acting President of the College

J. F. Duggar, Director of Experiment Station

AGRICULTURE:

J. F. Duggar, Agriculturist.
E. F. Cauthen, Agriculturist.
M. J. Funchess, Agronomist.
J. T. Williamson, Field Agt.
H. B. Tisdale, Associate Plant Breeder.
O. H. Sellers, Assistant.

VETERINARY SCIENCE:

C. A. Cary, Veterinarian.

CHEMISTRY:

B. B. Ross, Chemist.
E. R. Miller, Chemist Soils and Crops.
C. L. Hare, Physiological Chemist.

BOTANY:

W. A. Gardner, Botanist.
Robert Stratton, Assistant.

PLANT PATHOLOGY:

G. L. Peltier, Plant Pathologist.
E. F. Hopkins, Associate.

HORTICULTURE:

G. C. Starcher, Horticulturist.
J. C. C. Price, Associate.
C. L. Isbell, Assistant.

ENTOMOLOGY:

W. E. Hinds, Entomologist.
F. L. Thomas, Assistant.
J. M. Robinson, Assistant.

ANIMAL HUSBANDRY:

G. S. Templeton, Animal Husbandman.
E. Gibbens, Assistant.
G. L. Burleson, Assistant.
F. W. Burns, Assistant.

EDITOR:

Leslie L. Gilbert.

REPORT OF HATCH AND ADAMS FUNDS FOR 1918-1919

Receipts.

	Hatch	Adams
To amount from U. S. Treasury (Net)	$15,000.00	$15,000.00
Disbursements		
By Salaries	$ 7,740.19	$10,457.60
By Labor	3,085.72	1,193.01
By Publications	899.72	
By Postage and Stationery	202.33	89.45
By Freight and Express	218.08	317.70
By Heat, Light, Water and Power	313.82	233.07
By Chemicals and Laboratory Supplies	79.84	447.95
By Seeds, Plants and Sundry Supplies	281.33	205.49
By Fertilizers	274.55	158.98
By Feeding Stuffs	678.59	740.02
By Library	408.20	9.31
By Tools, Machinery and Appliances	247.92	187.26
By Furniture and Fixtures	60.00	15.75
By Scientific Apparatus and Specimens	114.29	422.58
By Live Stock		
By Traveling Expenses	137.26	466.43
By Contingent Expenses	20.00	
By Buildings and Land	238.16	55.40
Total	$15,000.00	$15,000.00

Respectfully,

M. A. GLENN,
Treasurer.

State of Alabama:

Lee County.

Personally appeared before me, B. L. Shi, a Notary Public in and for said county, M. A. Glenn, known to me as Treasurer of the Alabama Polytechnic Institute, who, being duly sworn, deposes and says the above foregoing account is true and correct. Witness my hand this 9th day of January, 1920.

B. L. SHI,
Notary Public, Lee County.

This is to certify that I have compared the account with the ledger account of the Treasurer, and this is a correct transcript of the same.

B. B. ROSS,
Acting President Alabama Polytechnic Institute.

REPORT OF DIRECTOR

Auburn, Ala., Jan. 22, 1920.

Dr. B. B. Ross, Acting President,
Alabama Polytechnic Institute,
Auburn, Ala.

Sir:

I herewith submit the following report for the past year of the work under my charge as Director of the Experiment Station:

PUBLICATIONS

For the fiscal year ending June 30, 1919, the publications of the Experiment Station consist of the annual report, four bulletins, three circulars, four press bulletins, and two indices, making a total of fourteen publications. Below are given their titles and the authors:

Bulletin No. 205: "Variety Tests of Wheat;" by the Agriculturist.

Bulletin No. 206: "Grazing Peanuts with Hogs versus Marketing a Crop of Peanuts;" by the Animal Husbandman. (From the Local Experiment Fund).

Bulletin No. 207: "Local Fertilizer Experiments with Cotton in South Alabama, 1914-1918, Inclusive;" by the Field Agent and Director. (From the Local Experiment Fund).

Bulletin No. 208: "Comparison of Peanut Meal, Cotton Seed Meal, Velvet Bean Meal, Ammonium Sulphate, and Nitrate of Soda, As Fertilizers for Corn and Cotton;" by the Agriculturist.

Circular No. 39: "The Argentine Ant and How To Control It;" by the Assistant Entomologist. (From the Local Experiment Fund).

Circular No. 40: "Annual Report of the Director of the Experiment Station on Work Done Under the Local Experiment Law in 1918;" (From the Local Experiment Fund).

Circular No. 41: "Late Planted Variety Tests of Corn;" by the Agriculturist.

Press Bulletin No. 95: "Conserving Alabama's Corn Crop;" by the Entomologist.

Press Bulletin No. 96: "Tests of Varieties of Corn in 1918;" by the Agriculturist.

Press Bulletin No. 97: "Tests of Varieties of Cotton in 1918;" by the Agriculturist.

Press Bulletin No. 98: "Velvet bean Seeds: Results of Germination Experiments;" by the Director and Plant Breeder.

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Index Volume XXV.

Thirty-First Annual Report.

MAIN LINES OF WORK IN VARIOUS DEPARTMENTS

The attached reports of heads of departments show lines of experimental work in progress in each. Allusion is here made briefly only to some of the most out-standing of these investigations.

Plant Breeding—As in previous years, plant breeding has been a line of work that has occupied a considerable proportion of the time of the staff in the agricultural department of the Experiment Station. The plants that are subjected to systematic courses of improvement, both in the process of studying the principles underlying the improvement of plants and in making these particular plants more productive, and of better quality, are chiefly cotton, corn, oats, and to a smaller extent wheat.

During the past year Spanish peanuts has been added to this list.

Cotton—Improvement of cotton through plant breeding has been concerned chiefly with the Cook and Cleveland varieties, and with numerous hybrids made at Auburn.

Having attained in large part the desired increase in productiveness and uniformity, as indicated by the high position in variety tests taken by the strains of cotton evolved on the Alabama Experiment Station farm, increasing attention is now being directed to an improvement in the length of lint of Cook and Cleveland varieties.

It is gratifying to report that the farmers of Alabama are making extensive use of the strains thus bred up at Auburn, though it is difficult to collect statistics showing the exact acreage planted in such seed. All seed of such origin is in urgent demand for planting. Indeed in many neighborhoods where these strains have been tested for several years the

seed produced locally from them has displaced other varieties of cotton on the farms of the most progressive farmers.

The testing of old and new varieties continues to receive attention as a means of informing the public of the value of new varieties, and also as a means of protecting the public against the excessive claims made on behalf of so-called new varieties that are often only new names for well-known varieties.

Oats—Among the results thus far apparent from the breeding of oats are much greater uniformity and larger yields from strains bred-up at Auburn. Probably the most hopeful indication from the work in hybridizing oats is the creation of a hybrid that is giving continued proof of increasing hardiness toward winter killing.

Experiments are continued in the successive planting of strains of oats in the spring as compared with the planting of the same original strain continuously in the fall. A continuous record is also being kept of the average difference between sowing in the fall as compared with sowing in February.

Forage Crops—Among the forage crops which have figured most extensively in experiments at Auburn are varieties of velvet beans, including the new bush velvet bean; varieties of soybeans, both for seed and for hay; and varieties and species of vetches.

Soils—Professor Funchess has continued his study of the causes of soil acidity, and of the relation to infertility of manganese and other elements sometimes found to be toxic.

During the past year he has been engaged in a determination of the amount of lime required, as indicated by laboratory tests, for numerous samples of soil taken from representative areas in widely scattered parts of Alabama. Other properties of these soils are also being investigated.

Insect Pests—The department of entomology has continued to make the weevil injuring corn its principal experimental project, and is investigating the value of sodium cyanamid for the treatment of soils with a view to the destruction of nematode worms causing root knot on a wide range of useful plants.

Horticulture—Among the experiments in progress are variety tests of pecans, peaches, apples, raspberries, and strawberries. An important investigation in progress in this de-

partment is a study of the optimum conditions both at harvest and during storage for the keeping of sweet potatoes in sound condition throughout the winter.

Plant Diseases—By utilizing the more expensive equipment of an institution in another state the plant pathologist has been enabled to make important contributions to our knowledge of the influence of temperature and humidity on the growth of the organism causing citrus canker. Scientists believe that the results found true with this organism will probably have application in the control or treatment of other plant diseases.

Changes in the Sweet Potato during Storage—The botanist has made progress in determining the changes in the sweet potato caused by low temperatures.

The research chemist has given his almost undivided attention to the study of the composition of the velvet bean, with special reference to finding some cause for the reported injurious effects of the feeding of velvet beans to pregnant sows.

The physiological chemist has assisted the animal husbandman in studying the effects of peanuts and other feeds on the hardness of pork by determining the melting points of lard produced. He has also made extensive analysis of cotton seed to determine the possibility of increasing at will the percentages of oil and other constituents.

Feeding Experiments at Auburn—With hogs these have been concerned chiefly with the effects on quality of pork and rapidity of gain from using various proportions of peanut meal as compared with a ration of whole peanuts and of mixed concentrates. Fish meal has also been compared with tankage. The hogging down of a field of corn and soy beans has been compared with the results from hogging down corn alone.

An experiment with dairy cows, not yet completed, is intended to ascertain the value of velvet bean meal as compared with wheat bran.

Animal Diseases and Parasites—Under the veterinarian's direction experiments have been conducted with hogs to determine the prevalence of any certain means of preventing some of the common parasites of hogs.

Respectfully submitted,

J. F. DUGGAR,

Director.

REPORT OF AGRICULTURIST

E. F. CAUTHEN

Auburn, Ala., Dec. 27th, 1919.

Director J. F. Duggar,
Auburn, Ala.

Sir:

I respectfully submit the following brief report of the experimental work done in field crops under Hatch and Adams funds at the Alabama Experiment Station in 1919. The work was in the main along the lines pursued in previous years.

Cotton—The variety tests included a comparison of eighteen common short staple varieties and of seventeen less common ones. The results of these tests are published in press bulletin No. 100. The regular test of long staple varieties was repeated. The effect of early and late thinning on amount of fruit, type of plant, and the time of setting bolls was studied; also the effect on earliness from planting seed on a level, on a high bed, and in a water furrow.

The test comparing the effect on yield, earliness, germination and strength of young plants from planting "light from light" and "heavy from heavy" cotton seed was continued to verify or nullify some conclusions reached from the study of the results of former years. This phase of the plant breeding work is about finished.

The breeding of the Cook and Cleveland varieties was continued in plant-to-row tests, and data along the same lines as in previous years were taken. A small plant-to-row test of Cook 588 was begun in 1918 and repeated in 1919 to see if certain objectionable characters, such as black seed and occasional green seed which have crept into this popular strain since it left the Experiment Station, might be removed. The results of the two year's test suggest that they can be worked out. Cook No. 1110 proved very promising this year, and surpassed the next most productive variety in the regular variety test by 62 pounds of lint cotton per acre. Seed of promising strains were placed among farmers for multiplication as a part of the work done under the Local Experiment law.

Corn—On the Experiment Station Farm sixteen varieties of corn were tested in an early planting, and seven varieties in a late planting. The different methods of planting and cultivating corn, known as the Williamson test, were repeated, and data covering eleven years are now being prepared for publication. The breeding work with corn under Mr. Tisdale was carried on along the lines pursued in 1918. Some of the more important strains were multiplied as largely as the limited space on the Experiment Station Farm would permit.

Oats—Especially promising strains of Fulghum and Red Rust Proof oats from the nursery rows were multiplied in rod and sixteenth-acre plots. In comparison with plots planted from unimproved seed of these varieties, the selected strains showed more uniformity in type and made larger yields of grain. The seed from the most promising strains were placed for multiplication with farmers agreeing to make local experiments. The regular fall planted variety test of oats, including the leading southern varieties, was repeated; the same varieties, including the more promising for spring seeding, were planted late in February.

The fall-versus-spring-planting test of the Red Rust Proof and Burt oats, which has been in progress many years, was repeated.

Hybrid oat No. 651, mentioned in my former report, showed its resistance to winter killing and promises to become a valuable hardy variety. It is now planted in the regular variety test for comparison of its yields with standard varieties.

Wheat—The regular variety test, consisting of twelve promising varieties adapted to southern states, was repeated. The Alabama Blue Stem showed a considerable increase over Fulcaster and other widely grown varieties. The fact that it was ten days earlier than the common varieties gave a decided advantage this year. Many promising selections were planted in rod plots in 1918, and the seed from the most promising rods were planted in 1919 in sixteenth-acre plots. About twenty bushels of pedigreed strains were turned over to the Local Experiment Division for testing in various parts of Alabama.

Soy Beans—The principal work with soy beans was a regu-

lar variety test for seed, and a similar test for hay. A test of soy beans, cowpeas, corn, peanuts, etc., was made to get comparative amount of grain of each and to compare the residual soil effect of each crop on succeeding crops. The test of different rates of seeding soy beans and cowpea mixtures for forage was repeated.

Rye—A regular variety test that included the leading southern varieties was made, and careful notes on habit of growth and resistance to anthracnose were taken. Rye was planted widely on the Station Farm as a cover crop; it was combined with vetch, crimson clover, and Canada field peas for forage and with different varieties of vetch.

Varieties of Vetch—A collection of vetches that offered promise for southern conditions was furnished by Bureau of Plant Industry and planted in 1918 and repeated in 1919. Oregon vetch No. 13420 did not lodge badly, remained green to the ground, and showed little stem disease. A strain of Angustifolia did not shatter badly when pods ripened. Both Oregon and Hairy vetch were tested in various mixtures with different kinds of small grains for forage.

Commercial Fertilizers—The fertilizer experiments of 1918 were repeated in 1919. The results of different dates of applying nitrate of soda to cotton agree with those obtained in previous years; largest yield coming from the application made before planting. A comparison of cottonseed meal, peanut meal, velvetbean meal, ammonium sulphate, and calcium cyanamid with nitrate of soda as a source of nitrogen was repeated with corn and cotton. When nitrate of soda and calcium cyanamid were applied on coastal plain soil under corn at planting and as a side dressing at different stages of growth, the nitrate of soda gave approximately 150 percent increase and the calcium cyanamid gave only 50 percent; but when they were applied to cotton in the same manner and on the same character of soil, they gave nearly equal increases.

When 240 pounds of duplex basic slag and 240 pounds of 16 percent acid phosphate per acre were applied on old poor upland coastal plain soil under corn, they gave practically the same increase. The tests of acid phosphate and ground rock phosphate under corn, cotton and oats were continued.

In the twelfth year of the test of different sources of nitrogen,

the acid condition of soil resulting from the continuous use of ammonium sulphate, produced decidedly injurious effects on the summer sorghum crop for forage and is now injuring the growing oats.

Potash from different sources was tested under wheat, corn, and cotton on coastal plain soil with results that indicate little preference to any particular kind or source. "Nitrapo" versus nitrate of soda and alkali salt under corn and sorghum for forage gave approximately equal increases in yield of crops. The dressing of equal amounts of nitrogen from nitrate of soda, calcium cyanamid, and ammonium sulphate, applied at different dates in the early spring on fall planted oats, gave the largest increase from that made March 3rd both from sulphate of ammonia and from nitrate of soda.

In addition to the above experiments, the following tests were made on the Alabama Experiment Station Farm in 1919:

Alfalfa fertilizer test.

Alfalfa with a nurse crop.

Canada peas for forage.

Crops, limed versus not limed.

Clover, species of.

Grasses, tests of species and varieties.

Japanese sugar cane for forage and for syrup.

Kudzu to smother nut grass.

Effects of kudzu for soil improvement.

Fertilizer test on wheat.

Methods of planting oats after cotton.

Melilotus and black medic for hay.

Oats, Tangier peas, and vetch for hay.

Acid phosphate versus raw phosphate.

Peanuts, variety test and spacing test.

Rotation of crops, heavily fertilized and moderately fertilized.

Sorghum, test of varieties for forage and for syrup.

Subsoiling.

Treatment of bur clover seed, hulled versus not hulled, etc.

Velvet beans, variety test and seed from different sources.

Respectfully submitted,

E. F. CAUTHEN,

Agriculturist.

REPORT OF AGRONOMIST

M. J. Funchess

Auburn, Ala., Dec. 11, 1919.

Director J. F. Duggar,
Auburn, Ala.

Sir:

Herewith I submit a progress report of the work done with Soils under Adams Fund during the year 1919.

Further studies on the toxicity of soluble manganese in acid soils indicates that manganese is to be regarded as a very good indication of an acid condition; but that of itself, it is not likely to produce harmful effects unless present in very large amounts. The toxicity of certain soil extracts is apparently due more to the acidity of the solution, or to the combined effect of acid and aluminum, than to the manganese which is frequently found. The results obtained by means of seedling cultures in soil extracts indicate that manganese carbonate may lower the acidity of such extracts, and thus render the solutions better mediums for growth.

Efforts to determine whether salts of aluminum were toxic more because of the acidity of such salts than because of the direct effect of the aluminum, gave disappointing results, since the aluminum could not be kept in solution when the acidity was destroyed.

Certain plants, like velvet beans and peanuts, appear to be more able to throw the aluminum out of solution, by neutralizing the acid, than other plants, like clover or Melilotus seedlings.

In recent work, several soils from north Alabama gave very acid extracts after incubation with dried blood. The samples of soil used were too small to permit a detailed study of the extract therefrom; it was shown, however, that each of these soils from which very acid extracts were obtained, supported nitrification of dried blood, and that soluble manganese was present in large quantities, in most cases. The work is considered very indicative, and will be extended during the next season, when it becomes possible to secure bulk samples of soil for this study.

Respectfully submitted,
M. J. FUNCHESS,
Agronomist.

REPORT OF PLANT BREEDER

H. B. TISDALE

Auburn, Ala., Dec. 15, 1919.

Prof. J. F. Duggar,
Auburn, Ala.

Sir:

The following is a report of my work under the Adams and Hatch funds for the year 1919:

A study of the correlation of the different ear characters and several plant characters of corn is being continued with the two prolific varieties; Experiment Station Yellow, a yellow flint variety, and Whatley, a white dent weevil-resistant variety. A special study is being made of the weevil resistant quality of corn to ascertain any effect it may have on the yield and other characters, and to find out the characters that may serve as a guide to the best yielding strains in field selection. The ear-to-row method is used on the two varieties to test strains of corn with characters showing high correlative coefficients, and to isolate strains best suited to Alabama conditions.

A study of the different strains of White Spanish peanuts has been started to determine any effect of selection on peanuts and to find out the different characteristics of high yielding strains. About 200 individual plants of White Spanish peanuts were selected and tested in a plant-to-row experiment on the Station farm.

A considerable number of germination experiments were made with velvet bean seeds, the results of which were published in press bulletin No. 98. Other germination experiments were made with peanuts. It was found that the vitality of a large percentage of peanuts is weakened or destroyed by commercial peanut shellers.

Respectfully submitted,

H. B. TISDALE,
Plant Breeder.

REPORT OF BOTANIST

WRIGHT A. GARDNER

Auburn, Ala., Dec. 22, 1919.

Director J. F. Duggar,
Alabama Experiment Station,
Auburn, Ala.

Sir:

I herewith submit a brief report of experimental work conducted by the Department of Botany during the past year.

Adams Fund Projects.

(1) Soil Toxin Project. The investigations of last year were continued and extended to include a larger number of soils with wider distribution.

(2) Sweet Potato Project. Progress has been made on this project. An attempt was made early in the year to determine what effects subjecting cured sweet potatoes to chilling had on the sugar and starch content as well as on the concentration of the cell sap. The results obtained indicate that the physiological changes induced by chilling well cured sweet potatoes are negligible. Further work along this line has been planned. Sweet potatoes have been harvested and cured under various conditions and the effects on their composition and metabolism are being determined. The preliminary results are very suggestive.

Hatch Fund Projects.

No extended projects have been definitely outlined under the Hatch Fund. Some work has been done on each of the following:

(1) Manganese poisoning of plants.
(2) Sprouting of early Irish potatoes for second crop.
(3) Nut grass eradication.
(4) Nutrient solutions.

Respectfully submitted,
WRIGHT A. GARDNER,
Botanist.

REPORT OF PLANT PATHOLOGIST

GEORGE L. PELTIER

Auburn, Ala., Dec. 30, 1919.

Prof. J. F. Duggar, Director,
Agricultural Experiment Station.
Auburn, Ala.

Sir:

I am herewith submitting a brief statement of the work now in progress in the Department of Plant Pathology.

(1) Under the Adams fund the Citrus-canker project has been continued along two principal lines.

a. Susceptibility and resistance to Citrus canker of the wild relatives, Citrus fruits, and hybrids of the genus Citrus.

b. The influence of temperature and humidity on the growth of *Pseudomonas citri* and of its host plants, and on infection and the development of the disease.

The first problem has been continued in cooperation with the Office of Crop Physiology and Breeding Investigation, Bureau of Plant Industry, United States Department of Agriculture, both in the greenhouse and field. A field laboratory and isolation field is maintained for this purpose at Loxley, Ala., Mr. W. J. Frederick, Ass't Pathologist, Bureau of Plant Industry, being in charge. The results obtained up to Nov. 1, 1919, are now ready for publication.

The second investigation was carried out for the Alabama Experiment Station in the Plant Physiology Laboratories of the Department of Botany, at the University of Illinois. As noted in my last report a four months stay in Illinois secured for this investigation the use of these laboratories that are provided with unusual facilities for this line of work. The results obtained during my stay at the University of Illinois are now in shape for publication.

Beginning July 1, 1919, under a cooperative agreement between the Alabama Experiment Station and the Bureau of Plant Industry, U. S. Department of Agriculture, the Pathologist will devote all his attention to a study of Citrus-Canker during the present fiscal year. Thus, a more thorough study

of this problem is possible, and arrangements have already been made to develop and complete the work begun at the University of Illinois last year.

It is sufficient to state here that both lines of work are well under way and some fundamental principles have been developed, which will not only have a decided bearing on the eradication and prevention of Citrus Canker, but which can also be applied in the prevention and control of other serious plant diseases as well.

(2) In cooperation with the Plant Disease Survey, U. S. Department of Agriculture, a very intensive survey of the State was made by Mr. L. E. Tisdale for the dreaded European potato wart, which has recently been discovered in Pennsylvania. Fortunately no signs of this disease were found in Alabama.

The rest of the work under the Local Experiment fund this year has been confined to continued observations on a number of troublesome plant diseases, some of which are new or little known in Alabama.

On Sept. 15, 1919, Mr. E. F. Hopkins accepted the position of associate Plant Pathologist. He will investigate especially the diseases of forage crops and their control.

Respectfully submitted,

GEO. L. PELTIER,

Plant Pathologist.

REPORT OF HORTICULTURIST

G. C. Starcher

Auburn, Ala., Dec. 30, 1919.

Prof. J. F. Duggar,
Director Alabama Experiment Station,
Auburn, Ala.

Sir:

In response to your request, I herewith submit a report on the progress of the work in this Department done under the Hatch fund for the year 1919.

Pecans—We are continuing our work on the variety tests of pecans. Some very interesting results were obtained this past year.

Peaches—The notes on the varieties of peaches in the old orchard have been continued, along with some new varieties that have originated here. The work on spraying and the use of various spray materials was continued this past year. Some very striking results were obtained. A new peach orchard of thirty varieties was planted to continue the work of testing desirable varieties for this State.

Pears—The notes on the varieties of pears, with special reference to susceptibility to Blight, were continued as usual.

Strawberries—The planting of twenty-nine varieties of strawberries gave some very interesting results this past year and will be continued for the coming year.

Raspberries—The notes on the varieties of raspberries were continued. Some good results were obtained. The notes on five varieties of blackberries, the Lucretia dewberry and loganberries were continued. Some of them look promising.

Sweet Potatoes—The work on harvesting and storing of sweet potatoes is being continued with reference to different times of digging and the effects of frost upon the curing and keeping. The past year's notes gave some very striking results and are being duplicated this winter. Some work was done this past season in testing several different fertilizers on sweet potatoes.

Tomatoes—The variety tests of tomatoes this past year were

a failure due to a very bad season.

Melons—The work on melons was continued but no results were obtained due to a very bad season.

Apples—All of the varieties of apples in the old orchard that proved to be worthless were removed and a new orchard was planted this past year. This orchard will include varieties of Southern origin for testing and special attention will be paid to the finding of suitable varieties for the extreme Southern end of the apple belt.

Grapes—A new grape vineyard was planted this past year. The ten varieties that gave best results in the old planting were selected and large plantings of each were made in order that the test may be continued on a larger scale.

Some work was begun in the greenhouse with the treatment of soils with sodium cyanide for Nematode. Some very striking results are showing on the crops now in the greenhouse.

Our work has been very much hindered due to the fact that we have such a limited quantity of land for this Department's use and the unevenness and roughness of the soil we have. Our work on the testing of fertilizers is very limited and it will be impossible for this Department to do any work of any great importance until our funds and equipment are increased.

Respectfully submitted,

G. C. STARCHER,

Horticulturist.

REPORT OF ENTOMOLOGIST

W. E. Hinds

Auburn, Ala., Dec. 20, 1919.

Prof. J. F. Duggar,
Auburn, Ala.

Sir:

Below I submit a brief report of the principal items of work in the Department of Entomology under Hatch and Adams funds during the year 1919.

1. *Rice Weevil*—This insect has been unusually abundant this season, and promises to do very serious damage to the 1919 crop. Further work has been done in the field control of this serious pest, and arrangements have been made to carry control of the rice weevil into the sphere of the Farm Demonstration work so that a large number of farmers may put into practice the very simple and effective measures of control developed by this investigation. The first important factor is the selection of a weevil-resistant type of seed ear, that is, ears which have an exceptionally tight-fitting shuck so that the tip of the ear is fairly well covered and protected against the first entrance of this species. The second point is the utilization of the trap plot method of concentrating the first generation of rice weevils in the field so that they may be controlled economically by proper handling of the small amount of corn that is grown on this trap area. Decided progress has been made in the work along these lines.

The study of weevil-resistant varieties in the field could not be continued in the fall of 1919 on account of the pressure of other field work under way at the time. This work should be continued further.

2. *Arsenate of Lead*—This project has been held in abeyance the past season on account of the scarcity of labor and the requirements of other phases of the work under way.

3. *Fumigation*—Work in soil fumigation has been continued and the value of Sodium Cyanide treatment of greenhouse soil, particularly, has been further developed. In a large scale outdoor study, using a variety of test plants, the results

have been so conflicting that additional study will have to be made before any conclusions can be reached. A laboratory study is under way to determine the possibility of destroying nematodes which have become embedded in the roots of growing plants without injuring the plants themselves. The results of this work will throw a good deal of light upon the question of the practicability of soil fumigation.

Respectfully submitted,

W. E. HINDS,

Entomologist.

REPORT OF ANIMAL HUSBANDMAN

GEORGE S. TEMPLETON

Auburn, Ala., Dec. 29, 1919.

Prof. J. F. Duggar, Director,
Alabama Experiment Station,
Auburn, Ala.

Sir:

I beg to submit herewith a brief report of the experiments conducted under the Hatch and Adams funds by the Animal Husbandry Department during the past fiscal year:

ADAMS FUND PROJECT

This experiment is a study of the influence of some southern feeds upon the properties (melting point, iodine value, keeping qualities, and color) of lard. Six lots of hogs were fed as follows:

Lot 1—5 hogs, corn 8 parts, tankage, 1 part.
Lot 2—5 hogs, corn 7 parts, peanut meal, 1 part.
Lot 3—5 hogs, corn 2 parts, peanut meal, 1 part.
Lot 4—5 hogs, corn 1 part, peanut meal, 1 part.
Lot 5—5 hogs, corn 2 parts, peanut meal, oil free, 1 part.
Lot 6—3 hogs, whole peanuts.

This experiment was planned with a view of determining the influence of various amounts of peanut meal on the carcasses, and the changes that might occur in the carcasses due to extracting the oil from commercial peanut meal by the gasoline process.

The hogs were on feed from December 28, 1918 to April 14, 1919, a period of 107 days. They were shipped to the Birmingham Packing Company, Birmingham, Alabama, and slaughtered. After the carcasses were chilled for thirty-six hours samples of kidney fat were collected and notes made on the relative firmness of the carcasses. The fat samples were turned over to Professor C. L. Hare of the Chemistry Department to determine melting points and iodine values.

Lots 1, 2, and 5 were firm and entirely satisfactory to the packer. Part of the hogs in Lot 3 killed out firm and part medium soft. All in Lot 4 classified medium soft. The hogs

in Lot 6 were very oily and were docked accordingly.

The average melting points for the lots were as follows:

Lot 1—40.3.

Lot 2—39.9.

Lot 3—40.5.

Lot 4—39.7.

Lot 5—42.4.

Lot 6—Semi-fluid.

HATCH FUND PROJECT

HOGS

Experiment No. 1

A comparison of fish meal and forty percent tankage as the protein supplement to corn in a fattening ration for hogs:

The tankage used was purchased from the Birmingham Packing Company, Birmingham, Ala. The fish meal was made from Menhaiden fish on the New England Coast, and was furnished by the Department of Agriculture at Washington to the Animal Husbandry Department.

Eight purebred Poland China gilts out of a litter of eleven were used in this experiment. They were divided equally into two lots, and fed 127 days. Lot 1 received fish meal one part and corn six parts. Lot 2 received tankage one part and corn six parts.

The analysis of the feeds used was as follows:

Fish Meal—Protein, 56.56; Fat, 6.89.

Tankage—Protein, 36.19; Fat, 21.68.

The pigs in Lot 1 made an average daily gain each of 1.37 pounds, and required 373 pounds of feed for 100 pounds gain. Those in Lot 2 made an average daily gain of 1.27 pounds, and required 404 pounds of feed for 100 pounds gain.

The individuals in the two lots averaged 63½ pounds in weight at the beginning of the experiment.

The ration containing fish meal produced a slightly larger average daily gain than did the ration containing tankage. Both rations proved very palatable and entirely satisfactory.

Experiment No. 2.

The object of this experiment was to determine the relative amount of pork per acre of a crop of peanuts as compared with a crop of soy beans and corn planted in alternate rows,

and to determine the influence of the soy beans on the quality of the carcass of the hogs grazing the combined crop of corn and soy beans.

The grazing part of the experiment lasted 38 days, at which time the five hogs that had hogged down the acre of corn were put into a dry lot and fed corn and tankage in self feeder. The seven hogs in the corn and soy bean field were allowed to continue grazing for 26 days, consequently the seven hogs had free access to the corn and soy beans in alternate rows for a total of 64 days.

At the close of the experiment the hogs were shipped to Swift & Company, Andalusia, Alabama. All of the hogs were entirely satisfactory to the packer and brought top prices on the date marketed. There was, however, on close examination a slight difference in the relative firmness in favor of the corn and tankage lot. Samples of kidney fat from the hogs in these two lots were turned over to the Department of Chemistry to determine melting points and iodine values.

DAIRY CATTLE

An experiment was started during the year to determine the relative feeding value of velvet bean meal and wheat bran as a part of the concentrate ration for milk production. Ten pure bred Jersey cows are being used in this test. The test is divided into two parts, pasture and dry lot periods.

This experiment has not continued for sufficient length of time to draw any conclusions.

Respectfully submitted,

GEO. S. TEMPLETON,

Animal Husbandman.

REPORT OF VETERINARIAN

C. A. Cary

Auburn, Ala., Dec. 18, 1919.

Director J. F. Duggar,
Experiment Station,
Auburn, Ala.

Sir:

The following is a brief report of work done during the year 1919.

(1) Tests were made on the use of Oil of Chenopodium for intestinal worms in chickens. Five drops of oil of chenopodium in 20 drops of olive oil were given once a day for four days. All food was kept away from the chickens for twenty-four hours before the first dose was given. The treated chickens were fed eight hours after the second, third, and fourth doses. Round worms from the intestine were passed without giving a purgative. The chickens were killed and in most instances all the intestinal parasites had been removed.

(2) Tests were made to determine whether or not hog lice would transmit hog cholera. Lice were secured from a hog having acute cholera. The lice were the common blood sucking type known as the *Haematopinus suis*.

(a) One pig four months old in normal condition was secured. Seventy-five lice were repeatedly washed in sterile water and then macerated and the product injected subcutaneously into this pig. Pig was kept by itself in small pen. Temperature was taken every day. On the seventh day temperature was 105.4 Fahr. On the ninth day it refused to eat, was drowsy, trembling and unable to stand. It was then killed and the common lesions of cholera were found.

(b) Upon another pig four months old, in good condition, from same source as (a) were put 150 hog lice obtained from a hog having acute cholera. In 14 days the temperature rose and on the 18th day this pig exhibited symptoms of cholera and was killed and post mortem findings were characteristic of hog cholera.

(c) A third pig, same age and size and from same source as (a) and (b) was kept in another pen as a check for 41 days and then it was given virus and developed hog cholera. This test will be repeated.

(3) Post mortem examinations of 50 virus pigs ranging from 40 to 90 pounds in weight, and from two to four months old, were made to determine the prevalence of the various intestinal worms in pigs. The ordinary round worm (ascaris suis) that resembles the earth worm was found in the intestines of 40 out of the 50 pigs. In other terms, 80 per cent of the pigs were infested. When we noted that one stage in the life history of this worm is spent in the lungs and there it often produces pneumonia, the importance of this parasite becomes paramount.

In 32 out of the 50 pigs were found the large thorn head worm. This worm is from 4 to 15 inches long and attaches itself to the intestinal wall. It irritates, infects and sometimes penetrates the entire intestinal wall. It was found in 60 percent of the pigs examined.

In 11 out of the 50 pigs *Spiroptera scutatum* was found. This is a thread worm in the mucus membrance of the oesophagus.

In 25 out of 50 were found the *oesophagostoma dentatum.* They are found usually in the caecum and colon and may cause anemia, emaciation, etc.

(4) Tests were again made by feeding nuts, leaves, stems and blooms of the *Aesculus pavia,* red buckeye.

(a) Two pigs were fed daily 7 ounces of pulverized nuts for 19 days. This was mixed at first with oats, and mixed feed and later it was mixed with a bran mash. There were no changes in temperature, pulse, respiration or mucous membranes,—no changes in the blood counts or hemaglobin during or after the test.

(b) Two shotes were fed leaves, stems and flowers for 18 days, as much as they could be induced to eat. No pathological or toxic effect was produced. It may be possible that there was no saponin or toxic glucosides in the nuts or plants fed because the condition of the plants or nuts was not in some way acted upon to produce toxic products.

The Farmers Summer School was held at Auburn, August 2nd to August 9th, 1919. There were 507 in attendance from 45 Alabama counties and 8 different States. Special efforts were made to give instruction to girls and women on home economics, sanitation, decoration, etc. The attendance and interest were very good.

Respectfully submitted,

C. A. CARY,
Veterinarian.

REPORT OF RESEARCH CHEMIST

E. R. Miller

Auburn, Ala., Jan. 19, 1920.

Professor J. F. Duggar, Director,
Alabama Experiment Station,
Auburn, Alabama.

Sir:

I submit herewith a brief report on the chemical composition of the velvet bean, an Adams fund project.

Beans from the Early Speckled variety: ash, 2.8-2.9 percent; calcium, 0.13-0.15 percent; magnesium, 0.14-0.16 percent; phosphorous, 0.4 percent; sulphur, 0.31 percent; chlorine, 0.021 percent; ether extract, 6.5 percent; protein, 20 percent; carbohydrates, principally starch, 30 percent; alcoholic extract, 12-13 percent. The alcoholic extract contains a phenolic substance.

Stems and leaves of the Early Speckled variety, collected when the fruit was mature. *Stems,* ash, 2.96 percent; *Leaves,* ash, 11.9 percent. From plants in bloom. *Stems,* ash, 4.37 percent; calcium, 0.71 percent; magnesium, 0.319 percent. *Leaves,* ash, 5.85 percent; calcium, 1.433 percent; magnesium, 0.214 percent; phosphorous, 0.187 percent.

The beans from several other varieties have been analyzed, but the results do not differ much from those of the Early Speckled variety.

Respectfully submitted,
EMERSON R. MILLER,
Research Chemist.

REPORT OF PHYSIOLOGICAL CHEMIST

C. L. HARE

Auburn, Ala., Jan. 2, 1920.

Prof. J. F. Duggar, Director,
Alabama Experiment Station,
Auburn, Ala.

Sir:

Work in this Department for the year 1919 included study in cooperation with the Animal Husbandry Department of the effects of peanuts, peanut meal, peanut meal oil free, corn and tankage upon the carcasses and fat of hogs receiving those products in various proportions in the rations.

In the study of the composition of cotton seed it has been found that high percentages of lint are associated with low percentages of oil in the ginned and in the unginned seed (seed cotton) and with small amounts of oil in unit number seeds.

There is no marked relation between percentages of lint and protein in the ginned seed, tho high lint percentages occur with seed showing a small amount of protein in unit number of seeds.

There seems to be no definite relation between percentages of lint and percentages of meats or of ash in the seeds. When results are expressed in terms of "Lint Index" or the amount of lint on 100 seeds, rather than in percentages of lint, it is found that high lint index is associated with large quantities of oil, protein and ash in unit number of seeds.

Respectfully submitted,

C. L. HARE,
Physiological Chemist.